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Japanese Published Unexamined (Kokai) Patent Application No. S63-205817, published August 25, 1988; Application No. S62-38606, filed February 20, 1987; Int. Cl.[4]: G11B 5/82 5/704; Inventor(s): Masami Otada et al.; Assignee: Matsushita Electric Works Corporation; Japanese Title: Jiki Dyisuku Kiban (Magnetic Disk Substrate)

Specification

1. Title of Invention

Magnetic Disk Substrate

2. Claim

A magnetic disk substrate, characterized in that the surface of a ceramic substrate is covered with a thermal resistant plastic layer.

3. Detailed Description of the Invention

[Field of Industrial Application]

This invention pertains to magnetic disk substrates without having magnetic layers before they become magnetic disk products.

[Technological Background]

Aluminum alloy substrates are mainly used for recent magnetic disk substrates, which are at a higher grade with a fewer pores at an extremely high purity. Using these aluminum substrates at a mirror surface cutting process by a mirror surface shearing means, the smoothness of the surface is improved. Complete products are obtained after a base treatment

and a magnetic layer coating have been applied onto the magnetic disk substrates processed as above. However, due to the mirror surface cutting process, the cost significantly increases.

In addition to the aluminum substrates, ceramic substrates (the surfaces of ceramic plates wrapped and polished are glass-coated) and glass substrates have recently been emerged. However, in order to obtain smooth surfaces, an abrasive machining must be applied to the surfaces or a grinding must be applied to the outer and inner diameters. This process incurs a higher cost.

If an extrusion molding is applied using resin alone, the productivity is high, and the cost is reduced. However, by a chemical and thermal treatments added during a formation of base layers and magnetic layers, a deformation occurs due to a thermal deformation and an absorption of moisture.

[Purpose of the Invention]

The purpose of the invention is to offer a light magnetic disk substrate with a high productivity and an excellent surface smoothness. No deformation occurs to the base layer and magnetic layers during a formation.

[Disclosure of the Invention]

As for the magnetic disk substrate of the present invention, the surface of the ceramic substrate is covered with a thermal resistant plastic layer.

With this structure, because the surface is covered with the plastic layer, a sufficient smoothness is achieved by smoothing the surface of a die. Due to this smooth surface, a mirror

surface cutting process and a grinding are not required. As a result, the productivity improves. Because a thermal resistant material is used for the plastic layer and because the ceramic substrate is used as a core material, this substrate does not deform during a formation of the base and magnetic layers. Furthermore, because the substrate consists of the ceramic layer and the plastic layer, it becomes lighter in weight in comparison with the weight of prior art single glass or ceramic substrates.

[Embodiment]

An embodiment of the invention is described in Fig.1 to Fig.4. Fig.1 illustrates a cross-section cut along a II line. The surface of a ceramic substrate 1 of this magnetic disk substrate is covered with a thermal resistant plastic layer 2. As shown in Fig.3, ceramic substrate 1 is formed into a wheel with a lightening hole 1a. For example, the substrate is punched at a raw material (green sheet) state by using a press machine. After these punched sheets have been set inside a die, plastic layer 2 is insert-molded by an extension molding (Fig.4). By removing a gate 2a by punching a central hole 3, a magnetic disk substrate is formed. Central hole 3 can be formed by using any method from the following methods: a punching inside the die; a punching at another process; a secondary cutting process. Reference number 4 refers to a substrate support hole which is formed using a flowing pin. More specifically, when ceramic substrate 1 is provided to the die, it needs to be flowed so as to match the center of the magnetic substrate. Accordingly, a positioning of ceramic substrate 1 is performed on the inner and outer circumferences that do not affect the properties of the magnetic disk substrate via the flowing pin. Other methods can be also used for the positioning.

For example, ceramic substrate 1 is made of an alumina material at a relatively lower grade. The smoothness of the surface is not required as a grinding is required. For example, the surface can be smooth as it is used for a widely used electronic circuit. The surface of plastic substrate 1 is preferably roughened so that the adhesiveness with plastic layer 2 is maximized. The thickness of ceramic substrate 1 is predetermined at about 50 to 90% of the thickness of the entire magnetic disk substrate. The thickness of the entire magnetic disk substrate with a 130 mm outer diameter is 1.9 mm. Plastic substrate 1 is equivalent to about 0.95 to 1.7 mm.

Plastic layer 2 is preferably made of a thermal resistant material with high water absorbency and excellent surface smoothness. Among thermal resistant engineering plastic materials, polyether imide (PEI) resin is used as this type of material and has a 200°C or higher melting point. No reinforcing material should be added to plastic 2 so as to improve the smoothness.

With this structure, the substrate is covered with plastic layer 2. Because of this, by smoothing the surface of the die, a sufficient smoothness is obtained on the surface. The mirror surface cutting process and the grinding (0.08 um or lower surface roughness R_{max}) are not required. Subsequently, the productivity improves. In addition to this advantage, a thermal resistant material is used for plastic layer 2, and ceramic substrate 1 is used as a core material. Because of this, plastic layer 2 and ceramic substrate 1 will not deform during a formation f the base layer and the magnetic layer. Furthermore, since the structure comprises ceramic substrate 1 and plastic layer 2, the weight is lighter in comparison with the weight of prior art single glass or ceramic substrate. When lightening hole 1a is provided as n the embodiment,

the weight of the substrate is equivalent to the aluminum substrate or lighter. Due to this light substrate, a reduction of the output of the disk driving motor and an energy saving are achieved. With the provision of lightening hole 1a, a sufficient strength is still obtained even when lightening hole 1a is provided.

[Advantageous Result of the Invention]

According to the invention, as the substrate is covered with the plastic material, a sufficient smoothness is obtained on the surface of the die by smoothing it. The mirror surface cutting process and the grinding are not required. The productivity subsequently improves. Since a thermal resistant material is used for the plastic material and since the ceramic substrate is used as a core material, the substrate does not deform during the formation of the base layer and the magnetic layer. Because the structure comprises the ceramic substrate and the plastic material, the substrate is lighter than prior art single glass or ceramic substrate.

4. Brief Description of the Invention

Fig.1 is a cross-sectional view illustrating an embodiment of the present invention. Fig.2 is a perspective view of the embodiment. Fig.3 is a perspective view of a ceramic substrate as in the embodiment. Fig.4 is a cross-sectional view of the ceramic substrate during a production.

1...Ceramic substrate

2...Plastic layer

3...Central hole

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